CLAIMS:

1. A method comprising:

applying a spreading code to a block of information-bearing symbols to form a set of chips for each symbol;

selectively interleaving the chips from the chip sets; and

generating a transmission signal from the interleaved chips.

2. The method of claim 1, wherein applying the spreading code comprises an orthogonal spreading code selected such that the interleaved chips retain their orthogonality after passing through a frequency selective communication channel.

3. The method of claim 1, further comprising communicating the transmission signal through a wireless communication medium.

4. The method of claim 1, wherein applying the spreading codes comprises:

applying a user-specific orthogonal spreading code to a block of K symbols to form a set of M chips for each symbol; and

storing the chips in an array having M columns and K+L rows, where L is a function of the communication channel length.

5. The method of claim 4, wherein generating the transmission signal further comprises:

padding each column of the array with L guard chips; and

generating the transmission signal by reading the chips from the array in column wise fashion.

6. The method of claim 5, wherein the guard chips comprise null values.

7. The method of claim 5, wherein the guard chips are selected from a common modulation constellation.

8. The method of claim 1 further comprising:

receiving the signal; and

de-interleaving the chips from the received signal.

9. The method of claim 8 further comprising separating the data according to a user.

10. The method of claim 9, wherein separating the data comprises applying a matched filter and a single-user decoding technique.

11. The method of claim 8, wherein de-interleaving the data comprises storing the chips in an array having M columns and K+L rows, wherein L is a function of the communication channel length and M represents a number of spreading codes within the set of spreading codes, and further wherein the M chips within each row of the array correspond to a common symbol.

12. The method of claim 11, wherein de-interleaving the data further comprises producing a stream of chips by reading the array in row wise fashion.

13. The method of claim 12, further comprising:

applying a matched filter to the stream of chips to separate signals from different users based on their code orthogonality and produce a stream of user-specific symbols;

applying a single-user detecting scheme to remove channel effects and output user-specific symbol estimates; and

converting the stream of user-specific symbol estimates into a serial data stream.

14. A computer-readable medium having instructions thereon to cause a programmable processor to:

apply a user-specific spreading code to a block of information-bearing symbols to form a set of chips for each symbol;

select chips from the chip sets to produce a stream of chips in which the chips from different sets are interleaved; and

generate a transmission signal from the stream of interleaved chips.

15. The computer-readable medium of claim 14 further including instructions to cause the processor to transmitting the signal through a wireless communication channel.

16. The computer-readable medium of claim 14 further including instructions to cause the processor to:

apply a user-specific orthogonal spreading code of length M to a block of K symbols to form a set of M chips for each symbol; and

store the chips in an array having M columns and K+L rows, where L is a function of the communication channel length.

17. The computer-readable medium of claim 16 further including instructions to cause the processor to:

pad each column of the array with L guard chips; and

generate the transmission signal by reading the chips from the array in column wise fashion

18. A computer-readable medium having instructions to cause a processor to:

receive a signal having interleaved chips generated from a block of information-bearing symbols;

write the interleaved chips column-wise into an array such that each row contains chips generated from the same received symbol; and

produce a stream of de-interleaved chips by reading the rows of the array.

19. The computer-readable medium of claim 18, wherein the instructions cause the processor to configure the array to have M columns and K+L rows, wherein L is a function of the communication channel length and M represents a number of spreading codes within the set of spreading codes, and further wherein the M chips within each row of the array are generated from a common received symbol which a weighted superposition of several transmitted symbols giving rise to intersymbol interference.

20. The computer-readable medium of claim 18, wherein the instructions cause the processor to:

apply a matched filter to the stream of de-interleaved chips to produce a stream of user-specific symbols;

apply a single-user channel equalization and symbol detection scheme to remove channel effects and output user-specific symbol estimates; and

convert the stream of user-specific symbol estimates into a serial data stream.

21. A transmitting device comprising:

a block-spreading unit to form a set of chips for each symbol of a block of information-bearing symbols and to produce a stream of chips in which the chips from different sets are interleaved; and

a pulse shaping unit to generate a transmission signal from the stream of interleaved chips.

22. The transmitting device of claim 21, wherein the block-spreading unit comprises:

a symbol-spreading unit to generate user-specific orthogonal spreading chips for each symbol within the block of symbols;

a buffer to store the sets of chips; and

a chip-interleaving unit to read chips from the buffer and output a stream of chips in which the chips from different sets are interleaved.

23. The transmitting device of claim 22, wherein the buffer stores the chips in an array having M columns and K+L rows, where L is a function of the communication channel length and M represents a maximum number of users.

24. The transmitting device of claim 23, wherein the buffer pads each column of the array with L guard chips.

25. The transmitting device of claim 24, wherein the chip-interleaving unit reads the chips from the array in column wise fashion.

26. The transmitting device of claim 22, wherein the symbol-spreading unit applies a user-specific orthogonal spreading code to a block of K symbols to form a set of M chips for each symbol.

27. The transmitting device of claim 22, wherein the transmitting device comprises a cellular phone.

28. A system comprising:

a transmitter to transmit a signal according to interleaved chips generated from a block of symbols; and

a receiver to receive the signal and de-interleave the chips.

29. The system of claim 28, wherein the transmitting device comprises

a block-spreading unit to form a set of chips for each symbol of the block and to produce a stream of chips in which the chips from different sets are interleaved; and

a pulse shaping unit to generate the signal from the stream of interleaved chips.

30. The system of claim 29, wherein the block-spreading unit comprises:

a symbol-spreading unit to generate user-specific orthogonal spreading chips for each symbol within the block of symbols;

a buffer to store the sets of chips; and

a chip-interleaving unit to read chips from the buffer and output a stream of chips in which the chips from different sets are interleaved.

31. The system of claim 30, wherein the buffer stores the chips in an array having M columns and K+L rows, where L is a function of the communication channel length and M represents a maximum number of users.

32. The system of claim 28, wherein the receiver comprises:

a block separator to store the interleaved chips column-wise into an array such that each row contains chips generated from the same received symbol with intersymbol interference, and to produce a stream of de-interleaved chips by reading the rows of the array;

a single-user detector to apply a matched filter to the stream of de-interleaved chips to produce a stream of user-specific symbols; and

a single-user channel equalization and symbol detection scheme to remove channel effects and output the estimated symbols.

33. The system of claim 31, wherein the receiver comprises a single-user detector that achieves performance equivalent to a set of M single user detectors.